SECTION 1
Introduction

1.1 Overview

The King County Department of Natural Resources invests heavily in water quality and water quality improvements through wastewater collection and treatment. As part of an intergovernmental effort to maintain and improve Puget Sound's water quality, King County oversees regional sewerage collection, treatment processes, and disposal systems which discharge wastewater to the Central Puget Sound Basin and waters flowing into the Sound.

King County's Water and Land Resources Division's (WLRD) Modeling, Assessment and Analysis Unit (MAA) supports a comprehensive marine monitoring program that assesses water quality in the Central Puget Sound Basin.

As stated above, the marine monitoring program is part of an intergovernmental monitoring effort focusing on Puget Sound marine waters with the County's program focusing on water quality within King County boundaries. The Washington Department of Ecology (water and sediment quality), Washington Department of Fish & Wildlife (contaminants in fish tissues), and Washington Department of Health (shellfish growing areas and contaminants) also monitor water quality in Puget Sound. These agencies have stations throughout the Sound. The main distinction between these programs is that the County has a larger number of stations within a concentrated area which are targeted near wastewater treatment plant discharges. Although other agencies have monitoring stations located within King County, these stations do not overlap with the County's stations which allows a greater proportion of Puget Sound to be monitored.

King County is planning on building a new regional wastewater treatment plant in northern King County or southern Snohomish County. The treatment plant will discharge secondary treated effluent through a marine outfall also located somewhere in northern King County or in southern Snohomish County. In support of siting a suitable location for the marine outfall, an extensive marine monitoring program (the Marine Outfall Siting Study) was initiated in October 1998 and will be on-going through at least 2003.

This report summarizes results of King County's National Pollutant Discharge Elimination System (NPDES) and ambient marine monitoring programs for 1999 and 2000. In addition, 1999 and 2000 Marine Outfall Siting Study (MOSS) water quality sampling results are summarized in this report.

This report is intended to provide an overview of the sites monitored, parameters measured, matrices (e.g., water and sediment) sampled, and summary of analytical results.

1.2 Sampling Area Characteristics

Puget Sound is a fjord-like estuary that extends approximately 230 kilometers (km) in a northsouth direction and is bordered by the Olympic mountains to the west and the Cascade mountain range to the east. The Sound consists of four major basins, including the Main (Admiralty Inlet and the Central Basin), Whidbey, Southern, and Hood Canal basins. The Whidbey basin is not a basin in the geological sense; its southern boundary is arbitrarily chosen to be an imaginary line running from Possession Point on Whidbey Island across the channel to Meadowdale in southern Snohomish County. The average depth in Puget Sound is 106 meters (m). The Main Basin, with depths greater than 280 m, is shielded at the main entrance to the Sound by Admiralty Inlet Sill which impedes the free exchange of deep waters. However, the Sound has near-oceanic salinity throughout the year, and is supplemented with cold, nutrient-rich, low-oxygenated deep water upwelled off the Washington coast during the summer months. Water from the Pacific Ocean enters the Sound through Admiralty Inlet and Deception Pass. Puget Sound contains approximately 168 billion cubic meters of water, with an average tidal exchange of 3.7 to 4.3 m and an average water volume exchange of 8 billion cubic meters with each tidal cycle (King County, 1994). A mixed semi-diurnal tide, which is characterized by two unequal high tides and two unequal low tides occurring each day, dominates the tidal pattern within Puget Sound. These characteristics are conducive to maintaining overall favorable water quality conditions in Puget Sound.

Many complex factors influence water quality in Puget Sound, including human activities, ocean currents, physical, biological, and chemical aspects. Offshore water samples consistently indicate good water quality however, nearshore sediments tend to accumulate contaminants from industrial and urban processes. Sediment carried in runoff from land plays a much greater role in Puget Sound's water quality than in most oceanic areas. Being surrounded by hills, lakes, and rivers in an urbanized area with substantial rainfall gives the Sound a multitude of complex sediment sources. The predominant sediment source is from rivers. The twelve largest rivers entering Puget Sound contribute approximately 1.8 million cubic meters of sediment annually. Their suspended load is highest during winter and early spring when heavy seasonal precipitation from storms erodes soil from the surrounding lowlands. Sediment sampling generally shows the highest levels of organic compounds in the nearshore areas of Elliott Bay, where urban runoff from storm drains, industrial sources, and nonpoint sources is the greatest.

1.3 Sampling Area

King County's NPDES and ambient marine waters study region is located within the Central Basin extending southwest to Tramp Harbor and southeast to Normandy Park, west to Vashon Island, and north to Richmond Beach (Figure 1-1). Elliott Bay, a large urban embayment, is also located within the County's study area.

The MOSS sampling region extends north from the southern portion of Admiralty Inlet to the west, around the southern tip of Whidbey Island to Possession Sound in the east. The southern boundary of the study area is the northern portion of Colvos Passage across to the main channel (see Figure 1-1). The MOSS locale includes areas in both King and Snohomish Counties.

Figure 1-1. King County Sampling Area in 1999 and 2000

1.4 Wastewater Collection and Treatment

Wastewater from homes, businesses, and industries within southern Snohomish and King Counties is transported through pipelines that belong to local sewer agencies and then through King County's system of much larger pipelines (interceptors) to the treatment plants operated by King County. At the plants, solids are separated from liquids. The liquids are then treated, disinfected, and discharged into Puget Sound marine waters. The solids are treated and the resulting rich organic material, known as biosolids, are recycled and used to enrich agricultural and forest soils.

The County provides wastewater treatment and disposal services to cities and local sewer and/or water districts and more than 200 million gallons of wastewater are transported and treated each day. To accomplish this, King County currently operates and maintains three wastewater treatment plants, two combined sewer overflow (CSO) treatment plants, 37 pump stations, and approximately 391 kilometers of pipelines (Figure 1-2). The West Point Treatment Plant (TP), South Plant (formerly known as the Renton and East Division Reclamation Treatment Plant), and Vashon Island TP provide secondary wastewater treatment. The Alki and Carkeek CSO Treatment Plants store combined wastewater and stormwater flow and later pump it to the West Point TP or provide the equivalent of primary treatment and disinfection before discharging it to Puget Sound.

King County took over operation of the Vashon Island Wastewater TP in November 1999. The plant discharges effluent through a 1300 foot outfall pipe located on the east side of Vashon Island south of Point Beals. The County is currently in the process of upgrading the existing facility as the TP is undersized to handle peak wastewater flows. It is anticipated that the new treatment facilities, including a longer outfall pipe, will be constructed adjacent to the existing plant and will be operational by 2005/2006.

The wastewater and CSO treatment plants discharge effluent directly into Puget Sound marine waters. The Clean Water Act states that all wastewater collection and treatment facilities that discharge effluent into surface waters are required to have a NPDES permit. In Washington, the Washington State Department of Ecology (Ecology) administers this program by delegation from the U.S. Environmental Protection Agency. NPDES permits set limits on the quality and quantity of wastewater that is discharged at each facility. The current NPDES permit for the West Point, Carkeek, and Alki TPs expired in 2000 but has been extended until the new five-year permit has been issued. The current South Plant NPDES permit will expire in 2002. The current Vashon Island TP NPDES permit expires in 2001 but has been extended until a new permit can be issued.

Figure 1-2. King County Wastewater Treatment Plant Locations